CLAIMS

1. A method for shielding an assembly of sensors that measures biomagnetic signals from external interferences, the assembly of sensors comprising at least one sensor, characterised in that the method comprises the steps of:

providing the assembly of sensors with at least one magnetic feedback, wherein the difference signal of one feedback is obtained from at least one sensor of the aforementioned assembly of sensors;

producing in the region of the assembly of sensors a magnetic field that compensates for external interferences with at least one actuator disposed outside the assembly of sensors; and the difference signal that produces a compensation voltage in the actuator is a linear combination of the signals of one or more sensors; and

using the SSS method to separate the biomagnetic useful signal being measured from the signals (originating from outside the measurement region), which signals are produced by the actuators and the external interferences.

2. The method as defined in claim 1, characterised in that the method further comprises the steps of:

forming a difference signal as a linear combination from the signals of two or more sensors of the assembly of sensors; and

feeding back the difference signal to the actuators, the compensating magnetic field being formed as a linear combination from the magnetic field produced by at least one actuator.

3. The method as defined in claim 2, characterised in that the method further comprises the step of:

selecting the difference signals to be obtained as a linear combination and the actuators to be

used so that as the feedback is switched on, the external interference signal is minimised.

4. The method as defined in claim 1, characterised in that the method is used in a magnetoencephalographic device (MEG).

5. The method as defined in claim 4, characterised in that the measurement sensor is coupled to two feedback loops, the first of them being a channel of an MEG device that operates in a flow-locked state and the second a feedback loop that controls the compensating actuator.

6. The method as defined in claim 1, wherein in the SSS method, a magnetic field that has been registered using a multi-channel measuring device is analysed in a geometry in which the interesting source is disposed in measurement volume V1, the sensors measuring the field or the components thereof outside volume V1 in volume V2, and the sources of the magnetic interferences and the actuators outside volume V1 and V2 in volume V3, which can be infinite, characterised in that the method further comprises the steps of:

parametrising the magnetic field produced by the interesting sources disposed in volume V1 in volume V2 as a sum of elementary fields, each of which is irrotational, sourceless and finite outside volume V1 so that a presentation of the desired accuracy is achieved for the parametrised magnetic field in volume V2;

parametrising the sum magnetic field produced by the interference sources and compensating actuators disposed in volume V3 in volume V2 as a sum of elementary fields, each of which is irrotational, sourceless and finite outside volume V3 so that a presentation of the desired accuracy is achieved for the parametrised magnetic field in volume V2;

calculating the signal vector of the measuring device corresponding to each elementary field;

measuring the magnetic signal using sensors; and

separating the fields produced from sources disposed in different volumes by calculating the components of the measured signal vector in the basis formed by the signal vectors associated with the elementary fields.

7. The method as defined in claim 1, characterised in that the actuator is a coil.

8. The method as defined in claim 2, characterised in that the method further comprises the step of:

feeding back the measured signal to the actuator via an amplifier and a feedback resistor.

9. The method as defined in claim 8, characterised in that in the method, the operation of the interference compensation to be produced using actuators is optimised by varying the values of the feedback resistors, by increasing the number of actuators and by varying the locations of the actuators.

10. The method as defined in any one of previous claims 1-3, characterised in that the method further comprises the step of:

placing the assembly of sensors and the actuators within a magnetically shielding room.

11. A system for shielding an assembly of sensors measuring biomagnetic signals from external interferences, the system comprising:

an assembly of sensors (10, 45) comprising at least one magnetic sensor;

a feedback coil (14) coupled to each sensors;

control electronics (11) controlling the measuring device;

c h a r a c t e r i s e d in that the system further comprises:

at least one magnetic feedback coupled to an assembly of sensors, wherein the difference signal of one feedback is obtained from at least one sensor (10, 45) of the aforementioned assembly of sensors;

at least one actuator (12, 13, 42, 43) disposed outside the assembly of sensors for producing a magnetic field in the region of the assembly of sensors (10, 45), the magnetic field compensating for external interferences; and the difference signal that produces a compensation voltage in the actuator is a linear combination of the signals of one or more sensors (10, 45); and

control electronics (11) for separating the biomagnetic useful signal from the signals (originating from outside the measurement region), which signals are produced by the actuators and the external interferences.

12. The system as defined in claim 11, c h a r a c t e r i s e d in that the system further comprises:

generation means (46, 47) of the difference signal for generating the difference signal as a linear combination from the measurement signals of two or more sensors (45) of the assembly of sensors; and

the aforementioned magnetic feedback (48, 40) for feeding back the difference signal to the actuators (42, 43), the compensating magnetic field being formed as a linear combination from the magnetic field produced by at least one actuator (42, 43).

13. The system as defined in claim 12, c h a r a c t e r i s e d in that the system further comprises:

the aforementioned difference signals and actuators (12, 13, 42, 43) so selected that as the feed-

back is switched on, the external interference is minimised.

14. The system as defined in claim 11, c h a r a c t e r i s e d in that the assembly of sensors (10, 45), the feedback coils (14) and the control electronics (11) function as parts of a magnetoencephalographic device (MEG).

15. The system as defined in claim 14, c h a r a c t e r i s e d in that the system further comprises:

each measurement sensor (10, 45) coupled to two feedback loops, the first of them being a channel of an MEG device operating in a flow-locked state and the second a feedback loop controlling the compensating actuator (12, 13, 42, 43).

16. The system as defined in claim 11, wherein in the SSS method, a magnetic field that has been registered using a multi-channel measuring device is analysed in a geometry in which the interesting source (15) is disposed in measurement volume V1, the sensors (10, 45) measuring the field or the components thereof outside volume V1 in volume V2, and the sources of the magnetic interferences and the actuators outside volume V1 and V2 in volume V3, which can be infinite, c h a r a c t e r i s e d in that the control electronics (11) is arranged to:

parametrise the magnetic field produced by the interesting sources disposed in volume V1 in volume V2 as a sum of elementary fields, each of which is irrotational, sourceless and finite outside volume V1 so that a presentation of the desired accuracy is achieved for the parametrised magnetic field in volume V2;

parametrise the sum magnetic field produced by the interference sources and compensating actuators (12, 13, 42, 43) disposed in volume V3 in volume V2 as a sum of elementary fields, each of which is irrota-

tional, sourceless and finite outside volume V3 so that a presentation of the desired accuracy is achieved for the parametrised magnetic field in volume V2;

calculate the signal vector of the measuring device corresponding to each elementary field;

measure the magnetic signal using sensors (10, 45); and

separate the fields produced from sources disposed in different volumes by calculating the components of the measured signal vector in the basis formed by the signal vectors associated with the elementary fields.

17. The system as defined in claim 11, characterised in that the aforementioned actuator (12, 13, 42, 43) that produces the magnetic field is a coil that has been connected to a device containing an assembly of sensors (10, 45) or to a separate frame around the assembly of sensors (10, 45), or to the walls, floor or ceiling.

18. The system as defined in claim 12, characterised in that the system further comprises:

an amplifier (24), a feedback resistor (25) and an actuator (12) as parts of the magnetic feedback.

19. The system as defined in claim 18, characterised in that in the system, the operation of the interference compensation to be produced using actuators (12, 13, 42, 43) is optimised by varying the values of the feedback resistors (25), by increasing the number of actuators (12, 13, 42, 43) and by varying the locations of the actuators (12, 13, 42, 43).

20. The system as defined in claim 11, characterised in that the system further comprises:

a magnetically shielding room as a place for the assembly of sensors (10, 45) and the actuators (12, 13, 42, 43).